Abstract Submitted
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Settling Regimes of Inertial Particles in Turbulence[1] GARRETT GOOD, Sibley School of Mechanical and Aerospace Engineering at Cornell University (CU-MAE), Max Planck Institute for Dynamics and Self-Organisation (MPI-DS), PETER IRELAND, CU-MAE, EWE WEI SAW, GREGORY BEWLEY, MPI-DS, EBERHARD BODENSCHATZ, CU-Physics, MPI-DS, ZELLMAN WARHAFT, CU-MAE — We present numerical and experimental evidence regarding the (1) enhancement and (2) reduction of particle settling speeds from their Stokes velocities by turbulence. Settling enhancement has long been attributed to particle path biases while various models have been proposed for settling reduction, including vortex trapping, loitering, and most commonly, non-linear drag effects. There is disagreement between experiment and DNS, and this work in particular is motivated by that highlighted in the entrainment study of Ireland & Collins (2012). Here, we take a new look at particles with both enhanced and reduced settling velocities, and focus on the transition between these two regimes and how it is affected by the large- and small-scale features of the turbulence. The numerical results show the relevant parameter space in unprecedented detail, while the experiments use a new apparatus which creates uniquely adjustable turbulence at its center (generated by thirty-two randomly driven loudspeaker jets) to measure settling speeds in real flows. We address current contention, and aim to paint a more comprehensive picture of particle settling.

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